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PTO/SB/05 (4/98)
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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 C.F.R. § 1.53(b))

Attorney Docket No. MURPHY 1- U.S.
First Inventor or Application Identifier BRIAN B. MURPHY
Title RADIOACTIVE SEED IMPLANTATION SYSTEM AND METHOD
Express Mail Label No. EL040436346US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

1. ☒ Fee Transmittal Form (e.g., PTO/SB/17)
(Submit an original and a duplicate for fee processing)
2. ☒ Specification [Total Pages 17]
(preferred arrangement set forth below)
- Descriptive title of the invention
 - Cross References to Related Applications
 - Statement Regarding Fed sponsored R & D
 - Reference to Microfiche Appendix
 - Background of the invention
 - Brief Summary of the invention
 - Brief Description of the Drawings (if filed)
 - Detailed Description
 - Claim(s)
 - Abstract of the Disclosure
3. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets 11]
4. Oath or Declaration [Total Pages 2]
- a. ☒ Newly executed (original or copy)
- b. ☐ Copy from a prior application (37 C.F.R. § 1.63(d))
(for continuation/divisional with Box 16 completed)
- i. ☐ DELETION OF INVENTOR(S)
Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).

5. ☐ Microfiche Computer Program (Appendix)
6. Nucleotide and/or Amino Acid Sequence Submission (if applicable, all necessary)
- a. ☐ Computer Readable Copy
- b. ☐ Paper Copy (identical to computer copy)
- c. ☐ Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

7. ☐ Assignment Papers (cover sheet & document(s))
8. ☐ 37 C.F.R. § 3.73(b) Statement of Power of Attorney (when there is an assignee)
9. ☐ English Translation Document (if applicable)
10. ☐ Information Disclosure Statement (IDS)/PTO-1449 [Copies of IDS Citations]
11. ☐ Preliminary Amendment
12. ☒ Return Receipt Postcard (MPEP 503)
(Should be specifically itemized)
13. ☒ Small Entity Statement(s) filed in prior application, Status still proper and desired (PTO/SB/09-12)
14. ☐ Certified Copy of Priority Document(s) (if foreign priority is claimed)
15. ☐ Other:

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16. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment:
- ☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No: _____

Prior application information: Examiner _____

Group / Art Unit: _____

For CONTINUATION or DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 4b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

17. CORRESPONDENCE ADDRESS

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Name (Print/Type)	MALCOLM R. MCKINNON	Registration No. (Attorney/Agent)	17,251
Signature	<i>Malcolm R. McKinnon</i>	Date	8/30/00

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See 37 C.F.R. §§ 1.27 and 1.28.*

TOTAL AMOUNT OF PAYMENT (\$ 432.00

Complete if Known

Application Number	
Filing Date	
First Named Inventor	BRIAN B. MURPHY
Examiner Name	
Group / Art Unit	
Attorney Docket No.	MURPHY 1-U.S.

METHOD OF PAYMENT (check one)

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Deposit Account Name MALCOLM R. MCKINNON

☐ Charge Any Additional Fee Required
Under 37 CFR §§ 1.16 and 1.17

2. ☒ Payment Enclosed:

☒ Check ☐ Money Order ☐ Other

FEE CALCULATION

1. BASIC FILING FEE

Large Entity		Small Entity		Fee Description	Fee Paid
Fee Code (\$)	Fee Code (\$)	Fee Code (\$)	Fee Code (\$)		
101 690	201 345			Utility filing fee	345
106 310	206 155			Design filing fee	
107 480	207 240			Plant filing fee	
108 690	208 345			Reissue filing fee	
114 150	214 75			Provisional filing fee	

SUBTOTAL (1) (\$ 345.00

2. EXTRA CLAIM FEES

Total Claims		Extra Claims		Fee from below		Fee Paid	
21	-20** = 1	1	9	9			
5	-3** = 2	2	39	78			
Independent Claims							
Multiple Dependent							

**or number previously paid, if greater; For Reissues, see below

Large Entity Small Entity

Large Entity		Small Entity		Fee Description
Fee Code (\$)	Fee Code (\$)	Fee Code (\$)	Fee Code (\$)	
103 18	203 9			Claims in excess of 20
102 78	202 39			Independent claims in excess of 3
104 260	204 130			Multiple dependent claim, if not paid
109 78	209 39			** Reissue independent claims over original patent
110 18	210 9			** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) (\$ 87.00

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity		Small Entity		Fee Description	Fee Paid
Fee Code (\$)	Fee Code (\$)	Fee Code (\$)	Fee Code (\$)		
105 130	205 65			Surcharge - late filing fee or oath	
127 50	227 25			Surcharge - late provisional filing fee or cover sheet.	
139 130	139 130			Non-English specification	
147 2,520	147 2,520			For filing a request for reexamination	
112 920*	112 920*			Requesting publication of SIR prior to Examiner action	
113 1,840*	113 1,840*			Requesting publication of SIR after Examiner action	
115 110	215 55			Extension for reply within first month	
116 380	216 190			Extension for reply within second month	
117 870	217 435			Extension for reply within third month	
118 1,360	218 680			Extension for reply within fourth month	
128 1,850	228 925			Extension for reply within fifth month	
119 300	219 150			Notice of Appeal	
120 300	220 150			Filing a brief in support of an appeal	
121 260	221 130			Request for oral hearing	
138 1,510	138 1,510			Petition to institute a public use proceeding	
140 110	240 55			Petition to revive - unavoidable	
141 1,210	241 605			Petition to revive - unintentional	
142 1,210	242 605			Utility issue fee (or reissue)	
143 430	243 215			Design issue fee	
144 580	244 290			Plant issue fee	
122 130	122 130			Petitions to the Commissioner	
123 50	123 50			Petitions related to provisional applications	
126 240	126 240			Submission of Information Disclosure Stmt	
581 40	581 40			Recording each patent assignment per property (times number of properties)	
146 690	246 345			Filing a submission after final rejection (37 CFR § 1.129(a))	
149 690	249 345			For each additional invention to be examined (37 CFR § 1.129(b))	

Other fee (specify) _____

Other fee (specify) _____

* Reduced by Basic Filing Fee Paid

SUBTOTAL (3) (\$

SUBMITTED BY

Name (Print/Type)	MALCOLM R. MCKINNON	Registration No. (Attorney/Agent)	17,251	Telephone	616-393-6400
Signature	<i>Malcolm R. McKinnon</i>	Date	8/30/00		

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Brian B. Murphy
For: Radioactive Seed Implantation System and Method

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231




CERTIFICATE OF MAILING BY EXPRESS MAIL

Sir:

I hereby certify that the attached correspondence is being deposited with the United States Postal Service as Express Mail Post Office to Addressee in an envelope addressed to: Box PATENT APPLICATION, Commissioner for Patents, Washington, D.C. 20231, Mailing Label No. EL040436346US on August 30, 2000.

Attached: Patent Application of Brian B. Murphy
 Drawings – 11 Sheets
 Utility Patent Application Transmittal Form
 Fee Transmittal for FY 2000
 Patent Application Fee Determination Record
 Declaration
 Statement Claiming Small Entity Status
 Check No. 4091 for \$432.00 covering application fee


Malcolm R. McKinnon, Attorney
Registration No. 17,251
Date: August 30, 2000

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**STATEMENT CLAIMING SMALL ENTITY STATUS
(37 CFR 1.9(f) & 1.27(b))—INDEPENDENT INVENTOR**

Docket Number (Optional)
MURPHY 1-U.S.

Applicant, Patentee, or Identifier: BRIAN B. MURPHY

Application or Patent No.: _____

Filed or Issued: _____

Title: RADIOACTIVE SEED IMPLANTATION SYSTEM AND METHOD

As a below named inventor, I hereby state that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees to the Patent and Trademark Office described in:

- ☒ the specification filed herewith with title as listed above.
☐ the application identified above.
☐ the patent identified above.

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- ☒ No such person, concern, or organization exists.
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Separate statements are required from each named person, concern, or organization having rights to the invention stating their status as small entities. (37 CFR 1.27)

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

BRIAN B. MURPHY
NAME OF INVENTOR

NAME OF INVENTOR

NAME OF INVENTOR

Brian B. Murphy
Signature of inventor

Signature of inventor

Signature of inventor

8/30/00
Date

Date

Date

RADIOACTIVE SEED IMPLANTATION SYSTEM AND METHOD

BRIEF SUMMARY OF THE INVENTION

This invention relates to radioactive seed implantation systems and, more particularly, to an improved multiple needle radioactive seed implantation system and method particularly adapted for use in the treatment of prostate cancer although it will be understood that the present invention is applicable to other uses.

As is well known, prostate cancer currently affects a significant number of men, particularly those aged 50 years or more. Each year, thousands of men are diagnosed with prostate cancer, and in the past, prostate cancer has often been diagnosed only when it was in an advanced and virtually incurable state. With the introduction of improved diagnostic procedures, including the PSA blood test, and increased public awareness of the situation, prostate cancer is now often being diagnosed at relatively early and curable stages. At the present time there are three fundamental treatments for prostate cancer, including radical surgery, external beam radiation, and radioactive seed implantation. Radical surgery has historically been very effective, but also has a relatively high rate of impotence and incontinence associated with it. External beam radiation has been reasonably effective for treatment of early stages of prostate cancer, and has fewer side effects than radical surgery. After the early stages of the disease, external beam radiation decreases in effectiveness relative to the surgical procedure. The third technique, radioactive seed implantation, involves the placement of radioactive seeds in the prostate gland. The radioactive seeds deliver high dosages of radiation to the prostate, but relatively low dosages to the surrounding tissue, whereby

the radiation is closely targeted to the prostate, resulting in the destruction of cancer cells in the gland before they can spread to other parts of the body.

Originally, seed implantation procedures were an open implant technique. In the open technique, the radioactive seeds were placed directly into the prostate gland through a surgical incision. However, this type of implantation has proven to be relatively unsatisfactory since the seeds are difficult to position properly. Recent developments involving radioactive seed implantation are referred to as transperineal seed implantation. This technique, which is described here in greater detail, has had excellent results generally equal to surgery. This technique is advantageous in that it can be preformed on an outpatient basis, permitting the patient to resume normal activities in a few days. The technique has proven to have relatively low incontinence and impotency rates and therefore has become increasingly utilized.

The goal of the transperineal technique is to significantly increase the accuracy of the placement of the radioactive seeds into predetermined locations within the prostate gland. This increase in accuracy is believed to account for the significant success rate of the technique and the other advantages discussed hereinabove. The transperineal technique utilizes a plurality of needles, typically as many as twenty-five to fifty, per treatment to position the seeds within the gland. The needles are inserted one at a time and are used with a specialized stepper apparatus, a transrectal ultrasound probe and a template for positioning and guiding the needles as they are individually moved manually to the desired position within the gland.

The needles used with the transperineal technique have some disadvantages. The insertion of the needles will typically result in movement of the gland. Because the

seeds are designed to be placed in precise locations within the gland, this movement of the gland can result in seeds being placed slightly off the desired target area.

The transperineal needles are loaded with the radioactive seeds prior to their insertion in the gland along with spacer elements which separate adjacent seeds. It is, of course, desirable to load the seeds into the prostate gland accurately and quickly. It is also known that in actual practice five or more insertions per needle are typically necessary to position each needle correctly. This may result in significant trauma to the gland, considering that as many as twenty-five to fifty needles are needed for each treatment. Swelling of the gland typically results, which also affects the accuracy of subsequently inserted needles. The accurate and proper placement of the needles is extremely important to the successful use of the seed implantation.

An object of the present invention is to overcome disadvantages in prior radioactive seed implantation systems of the indicated character, and to provide an improved radioactive seed implantation system and method that facilitates exact placement of radioactive seeds in a prostate gland.

Another object of the present invention is to provide an improved radioactive seed implantation system and method that reduces swelling of a prostate gland during implantation of radioactive seeds therein.

Another object of the present invention is to provide an improved radioactive seed implantation system and method which reduces the time required to implant radioactive seeds in a prostate gland and with less trauma to the patient.

Another object of the present invention is that, due to minimized trauma, patients will endure less 'post-surgery' pain which will ultimately lead to a fast and more comfortable recovery.

Another object of the present invention is to reduce operating room time and expense and surgical time and expense required to implant radioactive seeds in a prostate gland.

Another object of the present invention is to provide an improved radioactive seed implantation system and method incorporating multiple, individually longitudinally and infinitely adjustable needles which may be simultaneously implanted in a prostate gland with a minimum of time and expense.

Another object of the present invention is to minimize swelling of a prostate gland due to multiple needles being implanted in a prostate gland.

Another object of the present invention is to provide an improved radioactive seed implantation system that is economical to manufacture and assemble, durable, efficient and reliable in operation.

Another object of the present invention is to greatly minimize the risk of contamination which is considered very high in current procedures.

The above as well as other objects and advantages of the present invention will become apparent from the following description, the appended claims and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic side elevational view of a radioactive seed implantation system embodying the present invention, showing the same installed on a conventional stepping unit in conjunction with a conventional ultrasound probe and a pictorial representation of a patient;

Figure 2 is a schematic enlarged side elevational view of a portion of the structure illustrated in Figure 1;

Figure 3 is a top view of a portion of the structure illustrated in Figure 2;

Figure 4 is a front view of the structure illustrated in Figure 3;

Figure 5 is a back view of the structure illustrated in Figure 3;

Figure 6 is an enlarged view of the adjustable screw and needle connection illustrated in Figure 3;

Figure 7 is an enlarged top view of a portion of the structure illustrated in Figure 3 and illustrating the manner in which a measurement tube may be applied to the adjustment screws incorporated in the system embodying the invention;

Figure 8 is an enlarged end view of a wrench fitting provided on the end of each adjustment screw;

Figure 9 is a schematic exploded view of a portion of the structure illustrated in Figure 3;

Figure 10 is an enlarged schematic view of a portion of the structure illustrated in Figure 7 and illustrating the manner in which the needles are adjusted longitudinally;

Figure 11 is an enlarged schematic elevational view of needle structure embodying the present invention;

Figure 12 is an enlarged schematic view, with portions broken away, of the needle structure illustrated in Figure 11; and

Figure 13 is a schematic elevational view, with portions broken away, illustrating the manner in which radioactive seeds or spacers are preloaded into needles embodying the present invention.

DETAILED DESCRIPTION

Referring to the drawings, the present invention is schematically illustrated therein. In general, in utilizing the radioactive seed implantation system, generally designated 20, embodying the present invention, the patient is placed on an operating table 22, as shown in Figure 1, and an ultrasonic probe 24 is inserted into the patient's rectum. The ultrasound probe 24 is supported by a conventional stabilizing and stepping unit 26 which may, for example, be of the type marketed by Amertek Medical, Inc. of Singer Island, Florida under the trademark "SURE-POINT".

In accordance with the present invention, a needle support structure, generally designated 28, is provided which is mounted on the stabilizing and stepping unit 26. The support structure is comprised of a guide block 30 which defines a plurality of guide holes 32 arranged in rows and columns and in which individual needles 34 preloaded with radioactive seeds and spacers 36 or 36A are positioned. Any desired or conventional indicia, such as alphabetical letters and/or numerals (not shown) may be applied to the guide block for convenience in identifying the guide holes. In general, a plurality of individually adjustable needles are inserted through the guide block for subsequent implantation in the patient's prostate gland 38. Also, in the embodiment of the invention illustrated, the guide block 30 is provided with a longitudinal arch cutout

31 at the bottom of the block as indicated in Figures 4 and 5, the cut-out 31 being adapted to accommodate the top portion of the probe.

As shown in the drawings, the needle support structure 28 also includes a foundation cross bar 40, a stop cross bar 42, and a plurality of push plates 44 mounted on slide bars 46. The guide block 30, which is preferably formed of lead or other radioactive radiation shielding material, is secured to foundation legs 48 through the agency of small push pins 50 connected by wire 52 to the guide block 30 and passing through holes 54 in the adjacent end portions of the foundation legs 48.

In accordance with the present invention, individually adjustable screws 56 are precisely machine threaded into the push plates 44, an adjustable depth screw 56 being provided for each needle 34 in the grid of rows and columns of guide holes 32 whereby the depth of penetration of each needle 34 into the prostate gland 38 may be individually longitudinally and infinitely adjusted within the operating range of the system 20. In the embodiment of the invention illustrated, 144 needles 34 may be accommodated in the needle supporting structure 28, it being understood that the needle supporting structure may be designed to accommodate any desired number of needles. Also in the embodiment of the invention illustrated, six push plates 44 are provided with each push plate 44 accommodating two rows of needles 34, it being understood that movement of the push plates 44 toward the guide block 30 is stopped by the cross bar 42. It will also be understood that any desired number of rows of needles 34 may be provided which may be accommodated by any desired number of individual push plates 44, as for example one row of needles per push plate or as many as six rows of needles may be accommodated by one push plate in the embodiment of the invention illustrated.

Again, any desired or conventional indicia, such as combinations of alphabetical letters and/or numerals (not shown) may be applied to the push plates to identify the rows and columns of needles associated with the push plates.

Figure 6 illustrates the manner in which each of the screws 56 is connected to the implant needle 34 associated therewith, which needles will be described hereinafter in greater detail. As shown in Figure 6, a cap 58 is provided on the end of each screw 56, the cap 58 defining a recess 60 adapted to receive the adjacent end portion of an associated needle with a loose fit. With such a construction, the screws 56 may be easily disconnected from the associated needles after the needles have been pushed to a predetermined depth in the prostate gland 38 being treated. Each needle 34 will thus remain in the predetermined position within the gland until the needle is pulled back manually as will be described hereinafter in greater detail.

As shown in Figures 6, 11 and 12, each needle 34 is comprised of an elongate tube 62 which is formed of rigid material, such as surgical stainless steel, the wall 64 of the tube defining an internal passageway 66 adapted to receive an elongate push rod 68 with a sliding fit. The wall 64 of the tube also defines an elongate slot 70 adapted to receive a push tab 72 provided on the push rod 68 and projecting radially outwardly therefrom. With such a construction, preloaded spacers or radioactive seeds, sheathed by the associated needle as illustrated in Figures 11 and 13, may be unsheathed from the needle by manually holding the push tab 72 in a fixed position while simultaneously withdrawing the needle longitudinally relative to the push rod. If desired, the push rod 68 may be held in place through the agency of a needle-nosed instrument such as

surgical needle-nosed pliers (not shown), and/or the needle may be withdrawn simultaneously using the same or a similar instrument.

As shown in Figures 11 and 12, the end 74 of the tubular needle remote from the screw connecting end thereof is preferably provided with a razor sharp edge 76. Such a construction, along with the needle being formed of rigid material, minimizes deflection of each needle as it is inserted into the gland through the agency of the push plates.

In utilizing the radioactive seed implantation system 20 embodying the present invention, the prostate gland 38 of the patient is initially mapped utilizing the ultrasound probe 24 and the stepper apparatus 26 to establish a preplanned radiation therapy seed pattern. Such preplanned radiation pattern effected by the mapping of the gland is then utilized to position each needle 34 in a desired longitudinal position through the agency of the screws 56 previously described whereby the radiation seeds will be deposited in the desired locations in the gland. In that connection, a clear measurement tube 78 which fits over each screw as shown in Figure 7 may be utilized to set each needle 34 to a predetermined position whereby each needle will be inserted into the gland to a predetermined precise depth. The Allen-wrench fitting 80 provided on the end of each screw as illustrated in Figures 7 and 8 facilitates rotation of each screw in the associated pusher plate. The gradations 82 on the measurement tube 78 may be utilized in conjunction with the end surface of the screw to position each needle to the desired location.

If desired, the mapping of the patient's prostate gland may take place as much as several weeks prior to scheduled surgical insertion of the seeds in the gland, thereby

allowing sufficient time to position each of the needles in the support structure in the desired predetermined location. The screws 56 are adjusted on one push plate at a time prior to sliding the plates on the slide bars 46, and the clear measurement tube 78 also acts to guide in the Allen-wrench 84 thereby reducing setup time. As previously mentioned, the needle support structure may comprise one or more push plates, as desired. For example, one push plate may be adapted to accommodate all of the needles or multiple push plates may be provided, each adapted to accommodate some of the needles.

During the surgical implantation procedures, the ultrasound probe 24 is utilized to verify that the needles 34 are inserted to the previously determined desired longitudinal positions and that the radioactive seeds and spacers are deposited in the gland 38 at the previously determined desired locations. In that connection, the end space 86 in each needle may, for example, be filled with "bone wax" or other conventional material, to contain the seeds and spacers until the push rod 68 is activated. If desired, in utilizing the radioactive seed implantation system 20 embodying the present invention, increment markings 88 may be provided on the push rods, as illustrated in Figures 6, 12 and 13, for ease in verifying the position of the push rod within the associated hollow needle. It should be understood that the tabs are all individually preset when the needles are preloaded.

In utilizing the radioactive seed implantation system 20 embodying the present invention, each needle 34 is preloaded with a predetermined number of radioactive seeds 36 for the particular location where each needle is to be inserted into the prostate gland. The seeds in the needle are usually separated by spacers, as illustrated in Figures

11 and 13, so that the seeds and spacers alternate within a portion of the hollow needle, the spacers being conventional spacers made of material which can be accommodated in living human tissue and of the type utilized in prior single needle insertion techniques. An internal sliding push rod 68 is also positioned within the associated needle with the end of the push rod remote from the tab 72 abutting the adjacent seed 36 disposed in the needle. After the needle has been inserted in the prostate gland, the associated screw 56 may be disconnected from the needle, and the needle may be manually withdrawn from the prostate gland while the push rod 68 is held in place through the agency of the radially projecting tab 72. As each needle is withdrawn, the line of successive seeds and spacers within each needle is unsheathed from the needle, and the seeds and spacers remain in the gland. Thus the rod 68 and the seeds and spacers never really move as the needle cylinder is retracted backwardly in an unsheathing action with the result that the seeds and spacers are implanted at the desired positions within the gland. Of course, the rod is subsequently removed from the gland. It will be understood that after all of the seeds and spacers have been deposited in the gland, as for example the seeds and spacers in thirty to fifty needles, and the ultrasound probe 24 has verified that the seeds and spacers have been deposited in the predetermined desired locations, the ultrasound probe 24 may be withdrawn from the patient. The radioactive seeds may be formed of Iodine 125, Palladium 103 or other suitable radioactive material as desired.

The insertion of multiple needles in the gland through the agency of the push plates causes much less trauma to the patient as compared with the prior technique of inserting needles one at a time into the gland, and there is much less swelling of the gland because there is only one cut per coordinate, and because the time required to

insert all of the needles is materially reduced, as for example it may take 2 and 1/2 hours to insert all of the needles one at a time, whereas the present invention enables all of the needles to be inserted in about 20 minutes or less.

While a preferred embodiment of the invention has been illustrated and described, it will be understood that various changes and modifications may be made without departing from the spirit of the invention.

WHAT IS CLAIMED IS:

1. A seed implantation system comprising, in combination, a support structure, a plurality of spaced hollow needles carried by said support structure and having seeds disposed therein and sheathed thereby, means for individually adjusting the longitudinal positions of said needles relative to each other, means for simultaneously inserting a plurality of needles in predetermined positions in a patient whereby the sheathed seeds and the needles are disposed in predetermined positions within the patient, and means for unsheathing said seeds from such needles at said predetermined positions within the patient.
2. The combination as set forth in Claim 1, each needle having a tubular wall defining an elongate slot extending longitudinally of said needle, said means for unsheathing said seeds including a tab disposed in said slot and projecting radially outwardly of said needle thereby enabling relative movement of said needle relative to said seeds.
3. The combination as set forth in Claim 1, the leading ends of said needles being of sharp tubular configuration.
4. The combination as set forth in Claim 1, said means for adjusting the longitudinal positions of said needles relative to each other including screw means rotatable relative to said needles.
5. The combination as set forth in Claim 4 including means releasably connecting said needles to said screw means.

6. The combination as set forth in Claim 1, said support structure including a guide block defining a plurality of passageways each adapted to receive and support an individual needle for longitudinal movement relative to said support structure.

7. A radioactive seed implantation system for use in treatment of prostate cancer, said system comprising, in combination, a support structure, a guide block fixed to said support structure and defining a plurality of guide passageways disposed in rows and columns and adapted to receive elongate needles, a stop member fixed to said support structure and disposed in spaced relationship with respect to said guide block, a push plate mounted on said support structure for relative movement with respect to said stop member, a plurality of elongate needles releaseably connected to said push plate for simultaneous longitudinal movement with respect to said guide block, said needles being of tubular configuration and defining an elongate passageway adapted to receive and sheath radioactive seeds therein, and means for unsheathing said seeds from said needles in predetermined locations in the prostate gland of a patient.

8. The combination as set forth in Claim 7, each of said needles having a tubular wall defining an elongate slot, said means for unsheathing said seeds from said needles including an elongate push rod having a tab projecting radially outwardly through said elongate slot defined by the tubular wall of the associated needle.

9. The combination as set forth in Claim 7, and screw means for individually adjusting the longitudinal positions of said needles relative to the associated push plate.

10. The combination as set forth in Claim 9, the portion of each needle remote from the associated push plate having a sharp tubular end disposed at right angles with respect to the longitudinal axis of the needle.

11. The combination as set forth in Claim 9, and means for measuring the longitudinal positions of said needles relative to the associated push plate.
12. The combination as set forth in Claim 9, and wrench means for effecting rotation of said screw means relative to the associated push plate.
13. A radioactive seed implantation system for use in treatment of prostate cancer, said system comprising, in combination, a support structure, a guide block fixed to said support structure and defining a plurality of guide passageways disposed in rows and columns and adapted to receive elongate needles, a stop member fixed to said support structure and disposed in spaced relationship with respect to said guide block, a push plate mounted on said support structure for relative movement so as to engage said stop member, a plurality of elongate needles releaseably connected to said push plate for simultaneous longitudinal movement with respect to said guide block, said needles being of tubular configuration and defining an elongate passageway adapted to receive and sheath radioactive seeds therein, and means for unsheathing said seeds from said needles at predetermined locations in the prostate gland of a patient.
14. The combination as set forth in Claim 13, each of said needles having a tubular wall defining an elongate slot, said means for unsheathing said seeds from said needles including an elongate push rod having a tab projecting radially outwardly through said elongate slot defined by the tubular wall of the associated needle.
15. The combination as set forth in Claim 14, and screw means for individually adjusting the longitudinal positions of said needles relative to the associated push plate.

16. The combination as set forth in Claim 15, the portion of each needle remote from the associated push plate having a sharp tubular end disposed at right angles with respect to the longitudinal axis of the needle.
17. The combination as set forth in Claim 16, and measuring means for setting the longitudinally adjusted positions of said needles relative to each other.
18. The combination as set forth in Claim 15 including wrench means for effecting rotation of said screw means relative to the associated push plate.
19. An implant needle of tubular configuration and having a tubular wall defining an elongate passageway, said tubular wall defining an elongate slot communicating with said passageway, and an elongate push rod disposed in said passageway and having a tab portion projecting radially outwardly through said slot.
20. The combination as set forth in Claim 19, one end portion of said wall having a sharp tubular end disposed at right angles with respect to the longitudinal axis of said passageway.
21. A method of implanting radioactive seeds in a prostate gland of a patient comprising the steps of establishing a preplanned radiation seed pattern; preloading a plurality of needles with radioactive seeds located in predetermined positions therein; individually longitudinally and infinitely adjusting said needles relative to each other whereby the seeds are disposed in said predetermined seed pattern; simultaneously inserting a plurality of said needles into the prostate gland of a patient to a predetermined depth; and thereafter withdrawing the needles from the gland while maintaining the seeds in their predetermined seed pattern within the gland.

ABSTRACT OF THE DISCLOSURE

A radioactive seed implantation system particularly adapted for use in the treatment of prostate cancer, the system incorporating multiple individually longitudinally and infinitely adjustable needles carrying radioactive seeds which may be simultaneously and precisely implanted in a prostate gland with a minimum of surgical time and operating room expense while minimizing swelling of the gland and reducing patient trauma. An improved method of implanting radioactive seeds in a prostate gland is also disclosed.

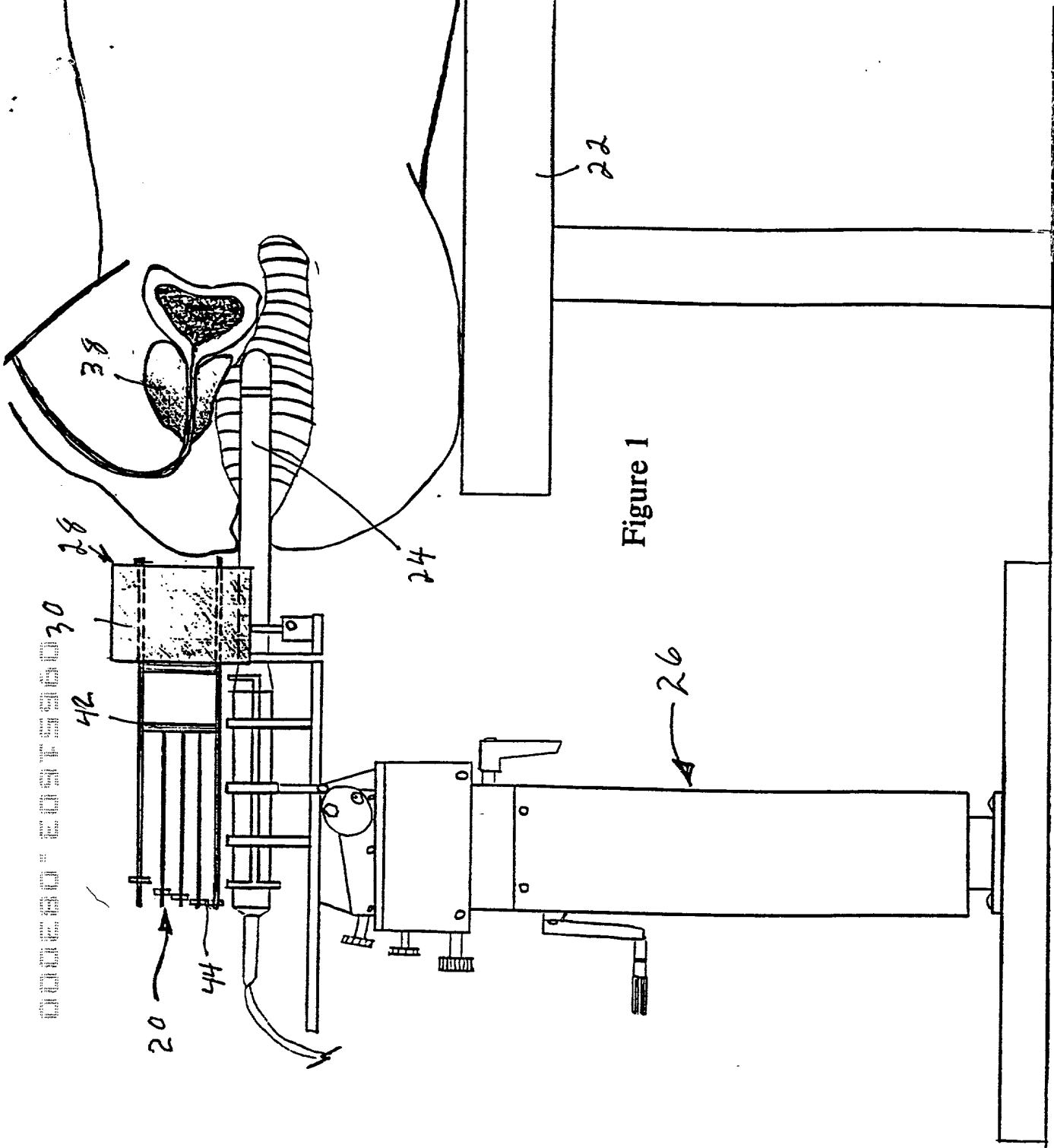


Figure 1

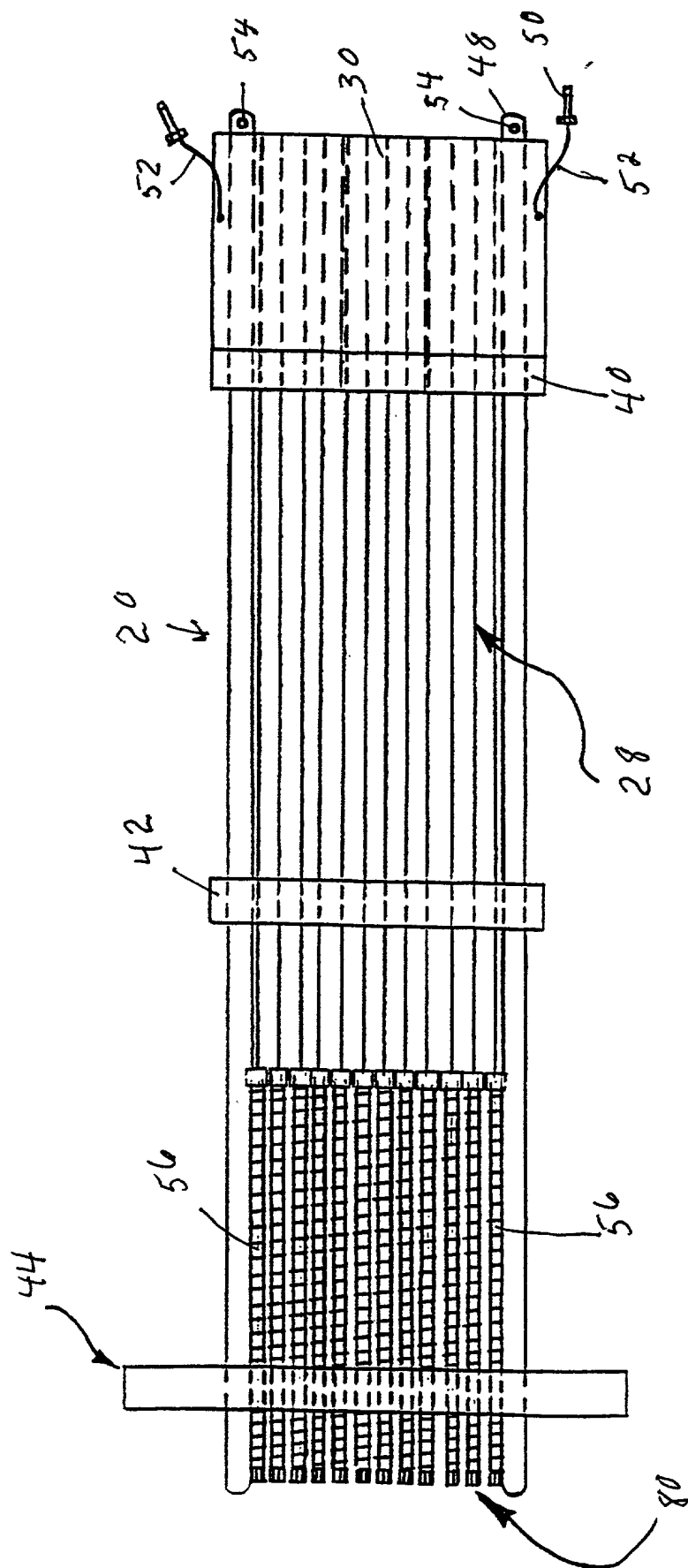


Figure 3

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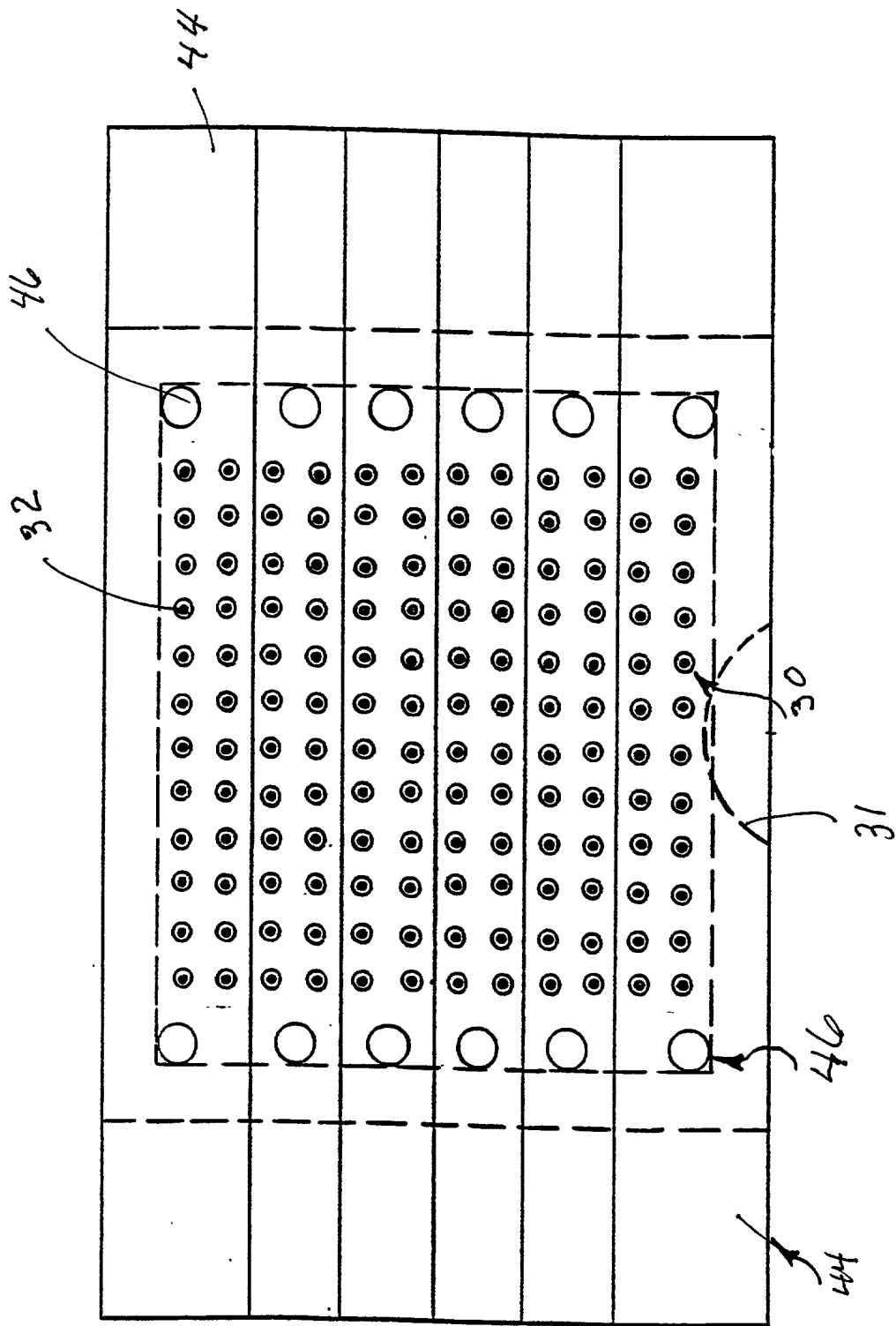


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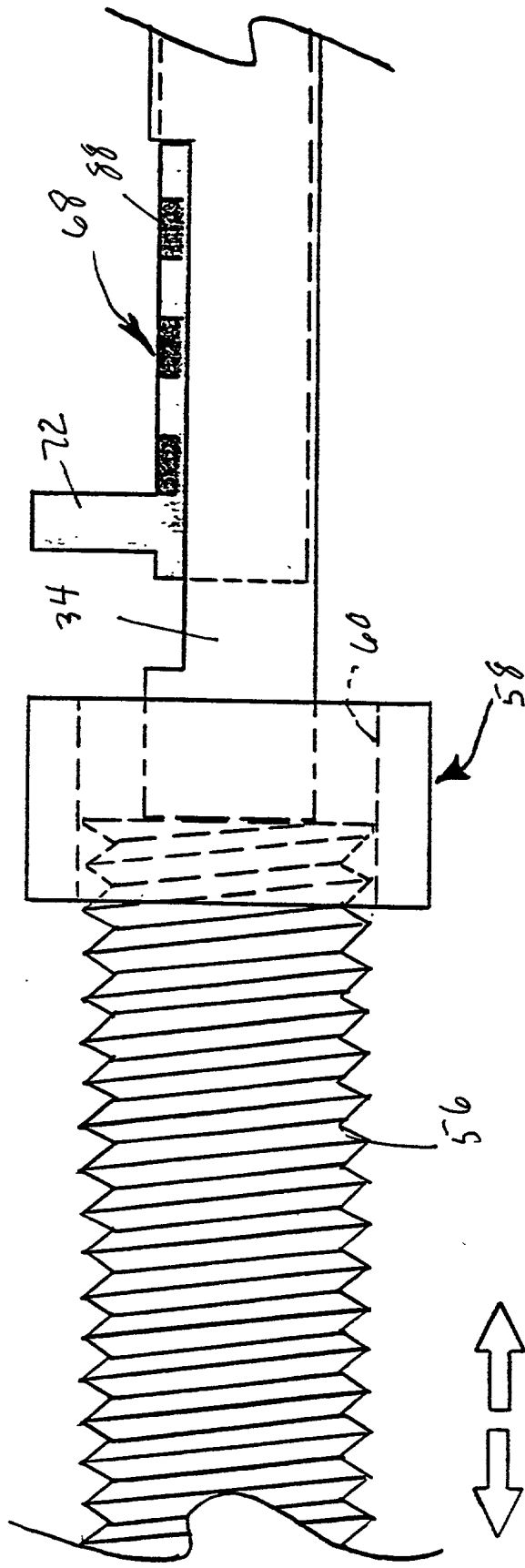


Figure 6

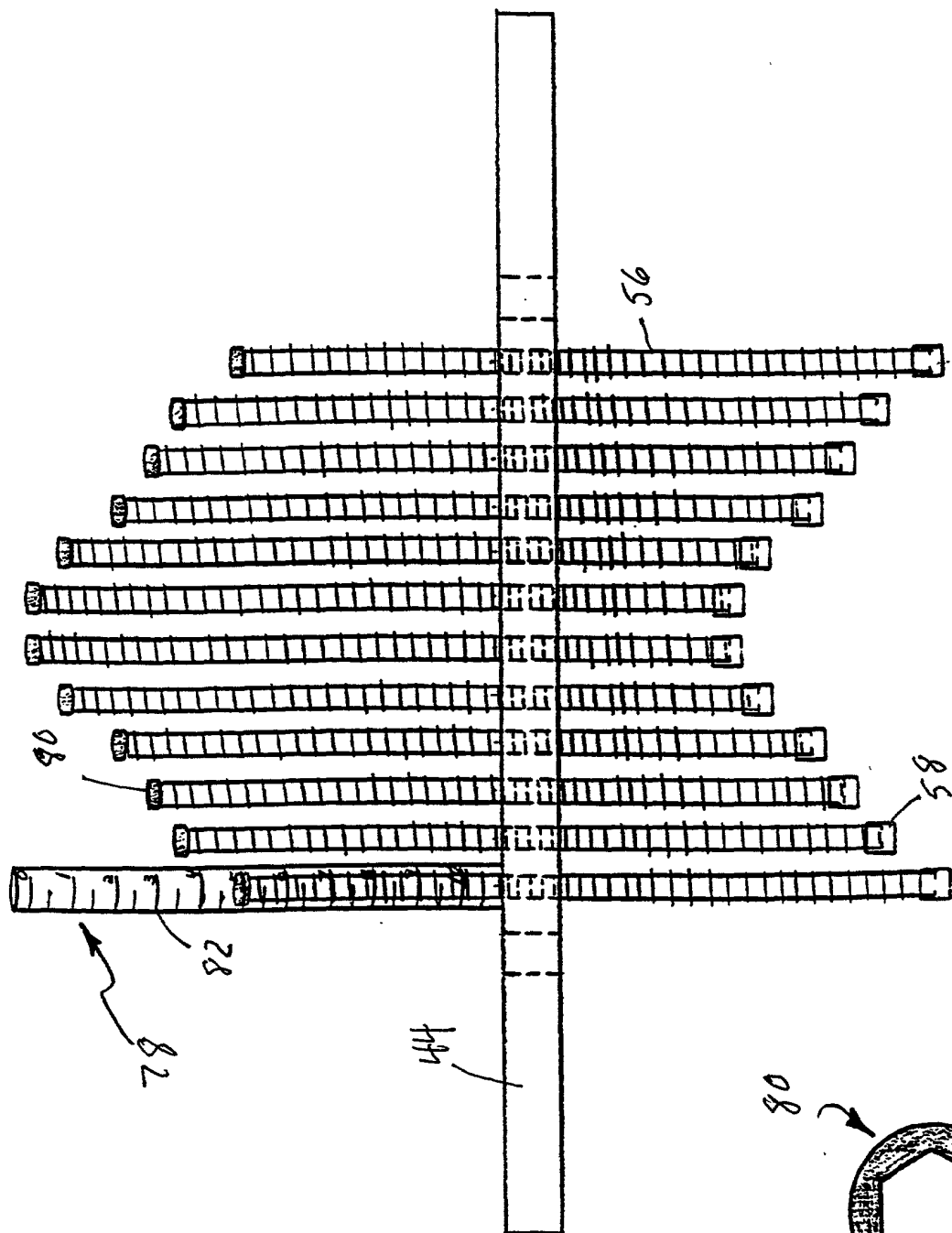
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Figure 7

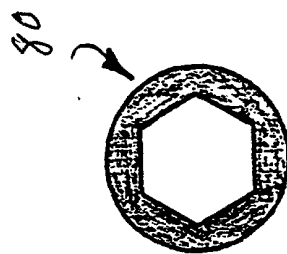


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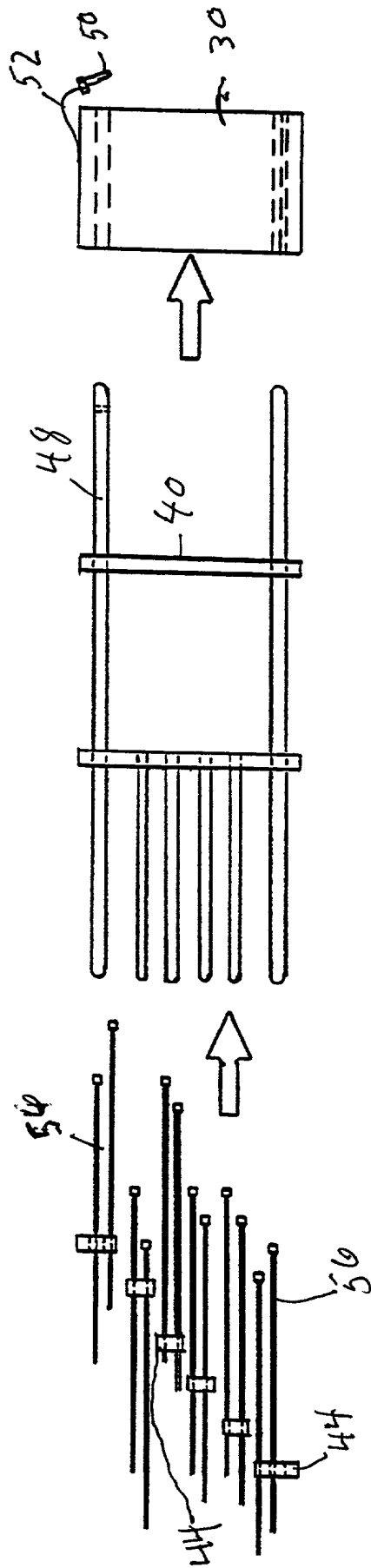


Figure 9

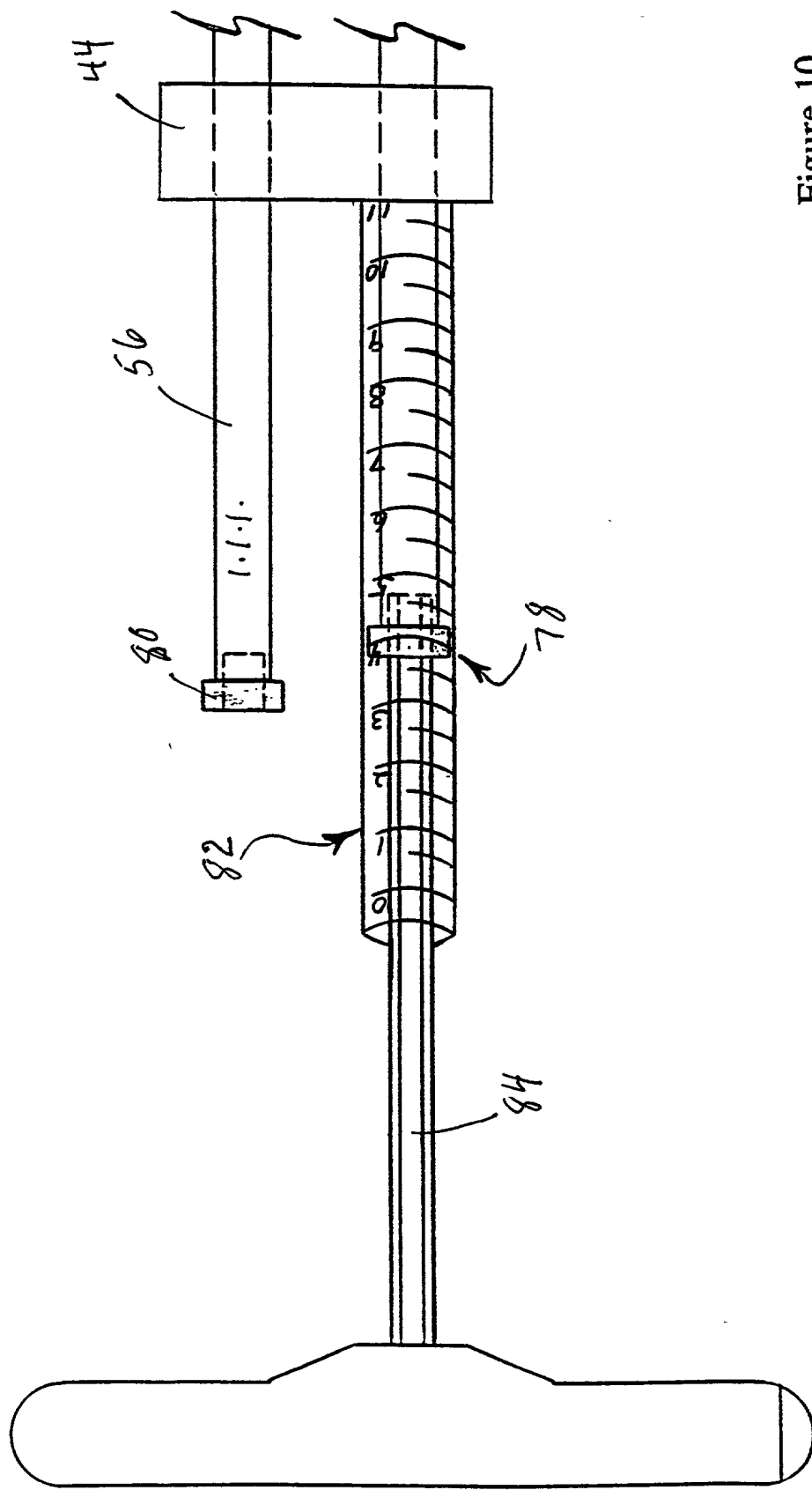


Figure 10

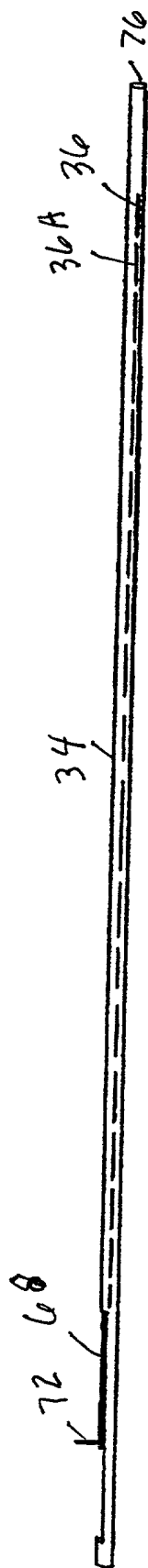
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Figure 11

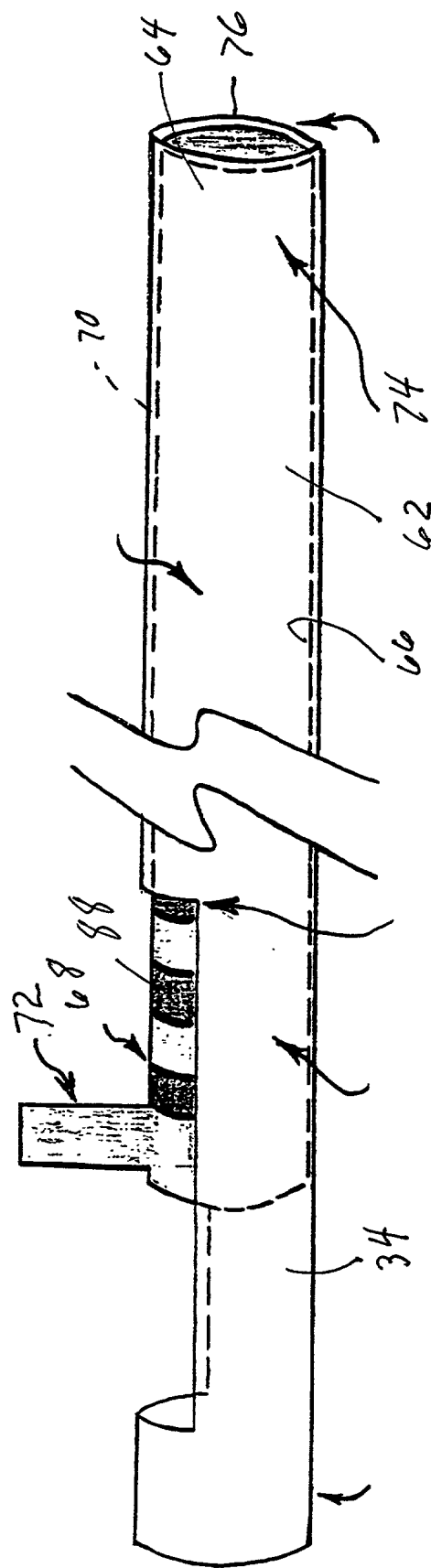


Figure 12

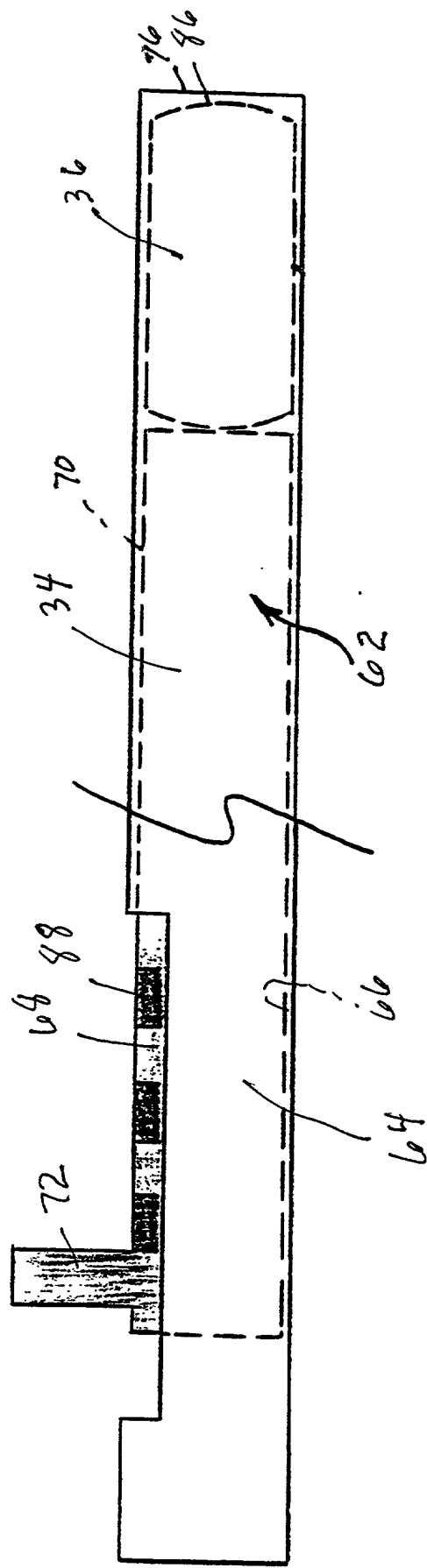


Figure 13

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DESIGN
PATENT APPLICATION
(37 CFR 1.63)**

☒ Declaration Submitted with Initial Filing OR ☐ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)

Attorney Docket Number MURPHY 1-U.S.

First Named Inventor Brian B. Murphy

COMPLETE IF KNOWN

Application Number /

Filing Date

Group Art Unit

Examiner Name

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

RADIOACTIVE SEED IMPLANTATION SYSTEM AND METHOD

the specification of which *(Title of the Invention)*

☒ is attached hereto
OR

☐ was filed on (MM/DD/YYYY) as United States Application Number or PCT International

Application Number and was amended on (MM/DD/YYYY) (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached?	
				YES	NO
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			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto:

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Application Number(s)	Filing Date (MM/DD/YYYY)	<input type="checkbox"/> Additional provisional application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

[Page 1 of 2]

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I hereby claim the benefit under 35 U.S.C. 120 of any United States application(s), or 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application or PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number (if applicable)

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MALCOLM R. MCKINNON	17,251		

☐ Additional registered practitioner(s) named on supplemental Registered Practitioner Information sheet PTO/SB/02C attached hereto.

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City	HOLLAND	State	MI	ZIP	49423	
Country	U.S.A.	Telephone	616-393-6400		Fax	616-393-4931

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name of Sole or First Inventor:		<input type="checkbox"/> A petition has been filed for this unsigned inventor			
Given Name (first and middle (if any))		Family Name or Surname			
BRIAN B.		MURPHY			
Inventor's Signature	<i>Brian B. Murphy</i>			Date	8/30/00
Residence: City	HOLLAND	State	MI	Country	U.S.A.
Post Office Address	615 Douglas Avenue, Unit D-4				
Post Office Address					
City	HOLLAND	State	MI	ZIP	49423
				Country	U.S.A.

☐ Additional inventors are being named on the _____ supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto